## REMARKS

In view of the foregoing amendments and following remarks, reconsideration of this application and early allowance of the application is respectfully requested.

Claims 1, 3-5, 7, 8, 13, 15, 32-35, 37 and 39 stand rejected under 35 U.S.C. § 103(a) for the reasons stated on pages 2-8 of the Office Action. Claims 16-19, 27-29 and 31 are objected to as being dependent upon a rejected base claim, but the Examiner notes that these claims would be allowable if rewritten in appropriate independent form.

Claims 15 and 37 have been canceled without prejudice. Claims 13, 16, 32-35 and 39 have been amended (claims 32 and 39 being amended to provide for appropriate claim dependency given the cancellation of claims 15 and 37 respectively). No new matter has been introduced.

Claim 16 has been rewritten in appropriate independent form. Accordingly, it is believed that claim 16, as well as claims 17-19, 27-29 and 31 by nature of their dependency from claim 16, are now in condition for immediate allowance, and notice to this effect is requested.

As set forth in detail in the specification and drawings of the present application and as stated in Applicant's response to the previous Office Action, Applicants' invention is directed to embodiments of a tire pressure monitoring method and system for a vehicle equipped with an anti-lock braking system (ABS). ABS wheel sensors sense variables which depend on travel distances covered by the vehicle wheels or rotational speed of the wheels. The periods of the sensor signals are counted to determine travel distance. An ABS control unit adds the variables of the individual wheels on the respective diagonals relative to the wheel arrangement of the vehicle. If the diagonal sums differ from one another by more than a preselected limit value an undesired (insufficient) tire pressure condition is recognized. Furthermore, monitoring

of the variables takes place in a plurality of monitoring cycles. An undesired tire pressure condition is recognized if the deviations of the diagonal sums exceed a limit value defined for all monitoring cycles.

Applicants have amended independent claims 13 and 33 to more particularly point out and distinctly claim the foregoing. Particularly, claim 13 now recites that the wheel sensors sense at least one of the travel distance covered by the wheels and the rotational speed of the wheels; and claim 33 now recites the steps of sensing wheel signal pulses associated with wheel rotation and counting the pulses in order to determine the travel distance covered by each wheel. Claims 34 and 35 have been amended to conform to amended claim 33 from which they depend.

Turning now to the Examiner's rejection of claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Boesch et al. U.S. Patent No. 5,721,528 in view of Eckelt U.S. Patent No. 5,206,643, Applicants respectfully traverse this claim rejection for the reasons detailed below. The Boesch and Eckelt patents, whether taken alone or in combination, do not disclose, yield or even suggest Applicants' claimed invention. Moreover, the references do not provide the motivation to combine them as suggested by the Examiner.

As Applicants have previously noted, the Boesch patent cited by the Examiner describes a method and system for detecting low tire pressure utilizing four wheel displacement sensors. According to Boesch, wheel displacement sensors measure the angular displacement of each wheel, and velocity values are calculated from these measurements. The velocity values are accumulated as displacement values until a predetermined distance is reached (column 4, lines 14-40). The "displacement" calculated according to Boesch is essentially an integral of velocity values over time. Boesch does not describe the use of travel distance to monitor tire pressure.

The Boesch approach introduces undesirable inaccuracies that are avoided by the present invention. Typically, a microprocessor is able to represent the digital signals with only a limited resolution. The microprocessors used in ABS systems often use simple integer calculation rather than floating point calculation, and are particularly inaccurate when performing division steps. Therefore, in order to obtain a more accurate result, as recognized by the present invention, it is desirable to use as few calculations steps as possible. This is particularly important given the high degree of accuracy of signal processing necessary to monitor tire pressure from the signals of wheel sensors due to the only very slight changes in tire rolling radius due to changes in tire pressure.

An embodiment of Applicants' invention is concerned with calculating travel distance by incrementing a count register each time a wheel sensor voltage passes through zero. Thus, the travel distance can be determined simply and accurately without numerous calculation steps by counting the periods of the sensor signals. Accordingly, the disadvantages of Boesch are avoided.

The Eckelt patent cited by the Examiner describes an automated vehicle rental system. To determine distance traveled by a rental vehicle according to the Eckelt system, a pulse counter is employed that has a sensor which, per revolution of a vehicle wheel, reads a mark moving past it and emits a pulse (column 5, lines 22-27).

Eckelt does not overcome the deficiencies of Boesch. Eckelt merely describes providing a pulse counter to determine miles traveled by a rental vehicle (for billing of rental customers or for determining vehicle service intervals), and is not at all concerned with monitoring tire pressure, let alone based on distance traveled. Accordingly, it is submitted that

one of ordinary skill in the art would not be motivated or equipped to combine Boesch and Eckelt to arrive at the present invention as claimed in claim 1.

Indeed, Applicants respectfully submit that in citing Eckelt in combination with Boesch, the Examiner has used the claimed invention as a blueprint for its own reconstruction. The invention must be viewed not after the blueprint has been drawn by the inventor, but as it would have been perceived in the state of the art that existed at the time the invention was made. See e.g., *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 547 (Fed. Cir. 1985), *W.L. Gore & Assoc. v. Garlock, Inc.*, 220 U.S.P.Q. 303, 312-13 (Fed. Cir. 1983).

Consequently, it is submitted that claim 1 is allowable and notice to this effect is respectfully requested.

Turning now to the Examiner's rejection of claims 3-5, 7 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Boesch in view of Eckelt and further in view of Okawa et al. U.S. 5, 591,906, Applicants respectfully traverse this claim rejection for the reasons detailed below. Significant differences exist between Applicants' claimed invention and the Boesch, Eckelt and Okawa patents which prevent these patents, whether taken alone or in combination, from disclosing, yielding or even suggesting Applicants' claimed invention.

The Okawa patent cited by the Examiner describes a device and method for detecting a tire pressure drop for a four-wheel vehicle based on measuring the rotational angular velocities of all four tires. The rotational angular velocity is calculated based on the number of pulses per unit time during measuring periods (column 4, lines 52-67, Figs. 8a, 8b and 10). The counting of pulses in Okawa is merely a sub-procedure for calculating velocity values, and the detection of tire pressure drop is based on velocity values. Thus, Okawa nowhere teaches or suggests determining travel distances covered by the wheels merely by counting wheel sensor

signal pulses.

As discussed above, Boesch and Eckelt do not teach or suggest the method claimed in claim 1 which clearly recites a process for monitoring vehicle tire pressure wherein wheel sensor signal pulses associated with wheel rotation are counted to determine travel distances covered by the wheels. Okawa does not overcome the severe deficiencies of Boesch and Eckelt with respect to claim 1, as Okawa also does not teach or suggest determining travel distances covered by the wheels merely by counting wheel sensor signal pulses. As set forth in the present application, such signal pulse counts avoid the undesirable inaccuracies associated with relying on calculated wheel velocities as taught in both Boesch and Okawa.

In view of the foregoing, it is respectfully submitted that one of ordinary skill in the art who reads and understands Boesch, Eckelt and Okawa would not be inclined, let alone equipped, to arrive at the present invention as claimed in independent claim 1. Claims 3-5, 7 and 8 depend from amended independent claim 1, and are patentable over Boesch, Eckelt and Okawa for the same reasons that independent claim 1 is patentable over these references. Claims 3-5, 7 and 8 are also allowable for the additional features recited therein. Notice to this effect is earnestly solicited.

Turning now to the Examiner's rejection of claims 13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Boesch in view of Skoff U.S. 6,594,566, Applicants respectfully traverse this claim rejection for the reasons detailed below.

Regarding claim 15, as this claim has been canceled from the present application without prejudice, the rejection of the claim is now moot.

Significant differences exist between Applicants' claimed invention and the Boesch and Skoff patents which prevent these patents, whether taken alone or in combination,

from disclosing, yielding or even suggesting Applicants' claimed invention. Moreover, the references do not provide the motivation to combine them as suggested by the Examiner.

Skoff generally describes a method for automatically inflating/deflating vehicle tires based on driving conditions. Embodiments of the Skoff method employ contactless tire pressure measurement monitoring (e.g., for tire failure detection). According to Skoff, vehicle tire pressure is measured automatically when the vehicle is started, a tire pressure setpoint is calculated in response to wheel speeds, axles load or traction requirements. The calculated pressure is compared against actual tire pressure, and the tires are inflated/deflated so as to maintain the setpoint pressure.

Independent claim 13, as presently amended, is specifically directed to a tire pressure monitoring system. The system includes a vehicle having a plurality of wheels, a plurality of axles for supporting the wheels, an anti-lock braking system including a control unit, wheel sensors located on at least one of the wheels and means for directly measuring tire pressure of at least one of the wheels. Claim 13, as presently amended, clearly and affirmatively recites that the wheel sensors sense at least one of the travel distances covered by at least one of the wheels or the rotational speed of at least one of the wheels. The control unit uses the travel distance or rotational speed values to detect tire pressure changes with corroboration from the direct pressure measurement.

Claim 13 is directed to a unique combination of indirect and direct tire pressure monitoring. As discussed in the specification, the use of direct tire pressure monitoring to corroborate the indirect tire pressure monitoring allows for greater accuracy. In a preferred embodiment of the present invention, only a subset of the wheels are provided with means for direct measurement of tire pressure (see, e.g., discussion of Fig. 6). Cost savings are realized by

reducing the number of direct pressure measurement components. At the same time, combination of the direct and indirect measurement allows for reliable and accurate tire pressure monitoring.

In contrast to the present invention as claimed in independent claim 13, neither Boesch nor Skoff describe using a combination of direct and indirect measurement to monitor tire pressure, let alone recognize that such a combination could be advantageous. Accordingly, it is submitted that one of ordinary skill in the art would not be motivated or equipped to combine Boesch and Skoff to arrive at the present invention as claimed in claim 13. Notice to this effect is respectfully solicited.

Turning now to the Examiner's rejection of claim 32 under 35 U.S.C. § 103(a) as being unpatentable over Boesch in view of Skoff as applied to claim 13 and further in view of Eckelt, Applicants respectfully traverse this claim rejection for the reasons detailed below.

Claim 32 depends from independent claim 13, and is concerned with using the combination of direct and indirect tire pressure measurement. As discussed above, Eckelt merely describes using a pulse counter to determine miles traveled by a rental vehicle, and does not describe nor even suggest using a combination of direct and indirect measurement to monitor tire pressure. Accordingly, one of ordinary skill in the art would not be motivated, let alone equipped, to combine Boesch, Skoff and Eckelt to arrive at the present invention as claimed in claim 32. Notice to this effect is respectfully requested.

Turning now to the Examiner's rejection of claims 33-35 under 35 U.S.C. § 103(a) as being unpatentable over Okawa in view of Skoff, Applicants respectfully traverse this claim rejection for the reasons detailed below.

Independent claim 33 is specifically directed to a method for monitoring tire pressure in a vehicle having a plurality of wheels, axles for supporting the wheels, and an anti-lock braking system including a control unit and wheel sensors. Claim 33 as presently amended, now clearly recites the steps of sensing wheel sensor signal pulses associated with wheel rotation and counting the pulses to determine the travel distance of each wheel of the vehicle.

As previously discussed, neither Okawa nor Skoff describe or even suggest using wheel travel distance, measured by counting periods of wheel sensor signals, to monitor tire pressure. Accordingly, claim 33 recites steps nowhere found in the Boesch or Skoff references, and the Boesch Skoff patents cannot render claim 33 obvious. Notice to this effect is earnestly solicited.

Regarding claims 34 and 35, these claims depend from independent claim 33 and are allowable by reason of the same distinctions discussed above with respect to claim 33. Claims 34 and 35 are also allowable for the additional steps and features recited therein. Notice to the effect that claims 34 and 35 are in condition for allowance is also earnestly requested.

Turning now to the Examiner's rejection of claims 37 and 39 under 35 U.S.C. § 103(a) as being unpatentable over Okawa in view of Skoff as applied to claim 33 and further in view of Eckelt, Applicants respectfully traverse this claim rejection for the reasons detailed below.

Regarding claim 37, as this claim has been canceled from the present application without prejudice, the rejection of the claim is now moot.

Claim 39, as presently amended depends from claim 33 and is directed to a method for monitoring tire pressure. Independent claim 33 now clearly recites the steps of sensing wheel sensor signal pulses associated with wheel rotation and counting the pulses to

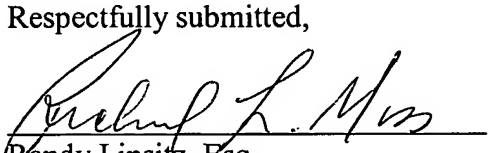
determine the travel distance of each wheel of the vehicle.

As previously discussed, Eckelt merely describes using a pulse counter to determine miles traveled by a rental vehicle, and does not describe nor even suggest using travel distance measured by counting periods of a wheel sensor to monitor tire pressure. In view of the foregoing, it is respectfully submitted that one of ordinary skill in the art who reads and understands Okawa, Skoff and Eckelt would not be inclined, let alone equipped, to arrive at the present invention as claimed in claim 39 as amended. Notice to this effect is respectfully requested.

In view of the foregoing amendments and remarks, Applicants have made a diligent effort to place this application in condition for immediate allowance, and notice to this effect is earnestly solicited. The Examiner is invited to contact Applicants' undersigned attorneys at the telephone number set forth below if it will advance the prosecution of this case.

The $ 86 fee associated with the amendment of claim 16 into independent form yielding one additional independent claim in excess of three is enclosed. Please charge any fee deficiency and credit any overpayment to Deposit Account No. 50-0540.

Respectfully submitted,



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